# IBM Informix 14.10

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# Introduction to IDS

**What is IDS?**

Informix Dynamic Server

An online transaction processing (OLTP) relational database management system (RDBMS)

**Focused on:**

Performance/Scalability

Ease of use/management

Business continuity

Security

Adaptability to business applications design

Support leading-edge development APIs

# Introduction to IDS

**Key industries**

Telco, Government, Retail, and Banking

# IDS Version History

Informix 3.3 released in 1984

Informix-online 5.00 released in 1991

Informix Dynamic Server 7.10 release in 1994

Informix acquires Illustra 1996

Informix Universal Server 9.14 released in 1997

IBM acquires Informix in 2001

# IDS Version History

**Informix releases:**

Informix Dynamic Server 11.10 July 2007

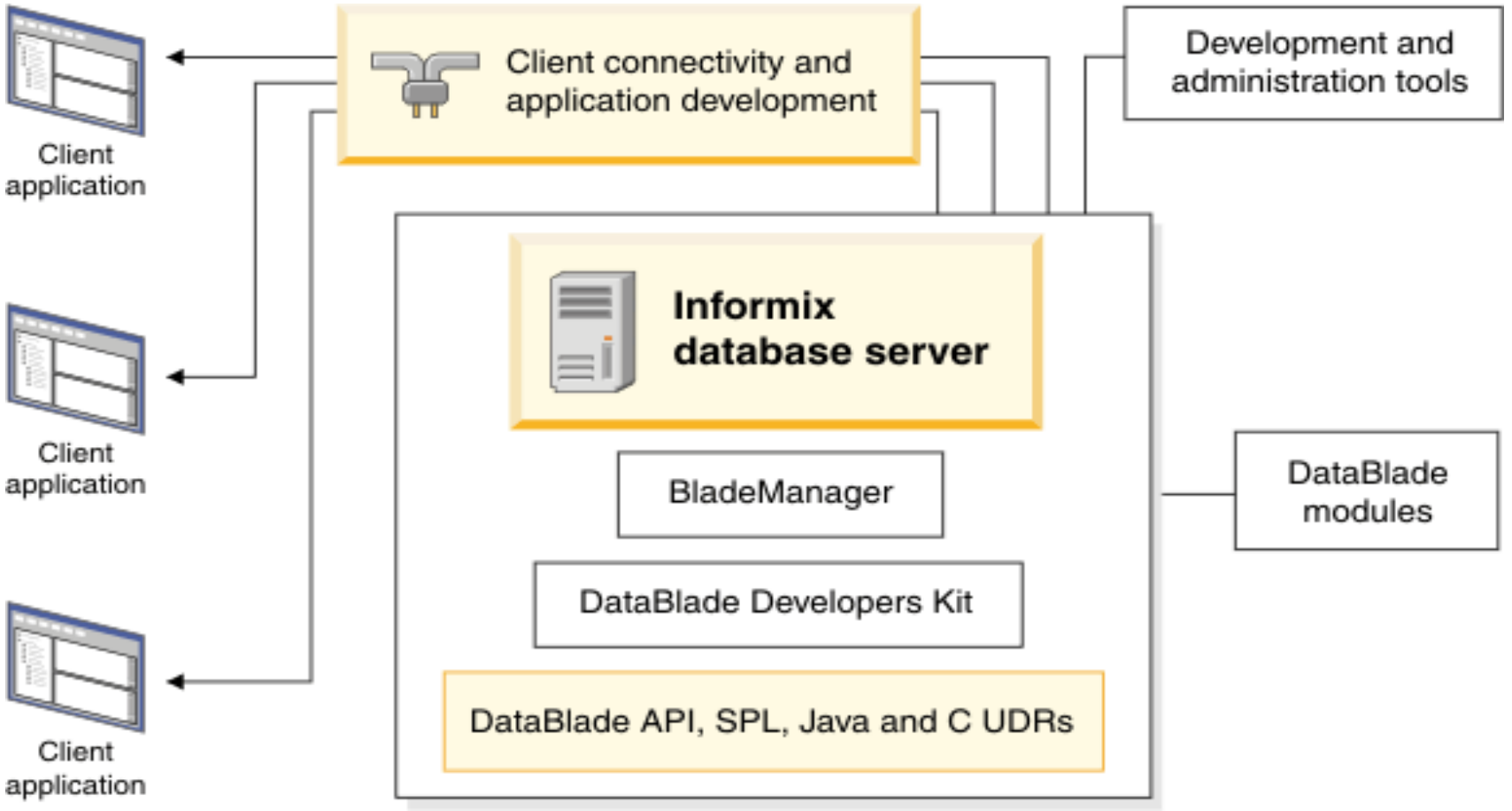
Informix Dynamic Server 11.50 April 2008

Informix Dynamic Server 11.70 Nov 2010

Informix Dynamic Server 12.10 March 2013 (HCL 2018)

Informix Dynamic Server 14.10 March 2019 (HCL)

# Architecture of Informix database server and related products



# Architecture of Informix database server and related products

Along with IBM Informix database server, you can also install **related products**, such as **client APIs** and other IBM products.

Depending on edition of Informix and operating system, **the product package includes** installation programs for some or all of the associated products:

# Architecture of Informix database server and related products

**Associated Products:**

IBM Informix Client Software Development Kit and IBM Informix Connect

Informix DataBlade Developers Kit (DBDK) (Windows)

IBM Informix JDBC Driver

IBM Informix BladeManager

IBM Informix Web Data Blade Module

International Language Supplement

IBM SPSS Statistics Desktop and Data Drivers

# Architecture of Informix database server and related products

**Associated Products:**

IBM SPSS Statistics Desktop and Data Drivers

IBM SPSS Modeler

IBM Data Studio

IBM Cognos Business Intelligence

# Architecture of Informix database server and related products

**IBM Informix Client Software Development Kit and IBM Informix Connect:**

Contains **client APIs** for developing and running client applications

Contains the IBM **OpenAdmin Tool (OAT) for Informix** for **monitoring** and managing the database server.

**IBM Informix Connect** contains **only the runtime libraries of the client APIs** to allow applications that run on client computers to access the database server.

# Architecture of Informix database server and related products

**Informix DataBlade Module**

A DataBlade module is a software package that extends the functionality of your IBM Informix database server.

The package includes SQL statements and supporting code written in an external language or Informix SPL.

Can also contain client components.

A DataBlade module enables your Informix database server to provide the same level of support for new data types as it provides for built-in data types.

Users access DataBlade module services in the same way they access database server services: through SQL, SPL, and client programs linked with any of the Informix client APIs.

Can also use the DataBlade API or SQL queries to access data types and routines in other DataBlade modules.

# Architecture of Informix database server and related products

**Informix DataBlade Module**

The Informix DataBlade Developers Kit aids you in developing DataBlade modules.

It provides graphical user interfaces to complete tasks, and it generates much of the code you need for your DataBlade module.

# Architecture of Informix database server and related products

**Informix DataBlade Developers Kit (DBDK) (Windows)**

The IBM Informix DataBlade Developers Kit (DBDK) provides the following graphical user interfaces for creating and working with DataBlade modules:

**BladeSmith**

A tool for organizing a DataBlade module development project.

You use to create a project and then define the objects (such as data types and routines).

Generates source files, header files, makefiles, functional test files, SQL scripts, messages, and packaging files.

# Architecture of Informix database server and related products

**DBDK Visual C++ Add-In and IfxQuery**

Tools for debugging a DataBlade module by using Microsoft Visual C++ on Windows.

The add-in automates many of the debugging tasks and calls the IfxQuery tool to run unit tests for DataBlade module routines.

**BladePack**

A tool for creating a DataBlade module package.

BladePack can create a simple directory tree containing files to be installed or an installation that includes an interactive user interface.

# Architecture of Informix database server and related products

**BladeManager**

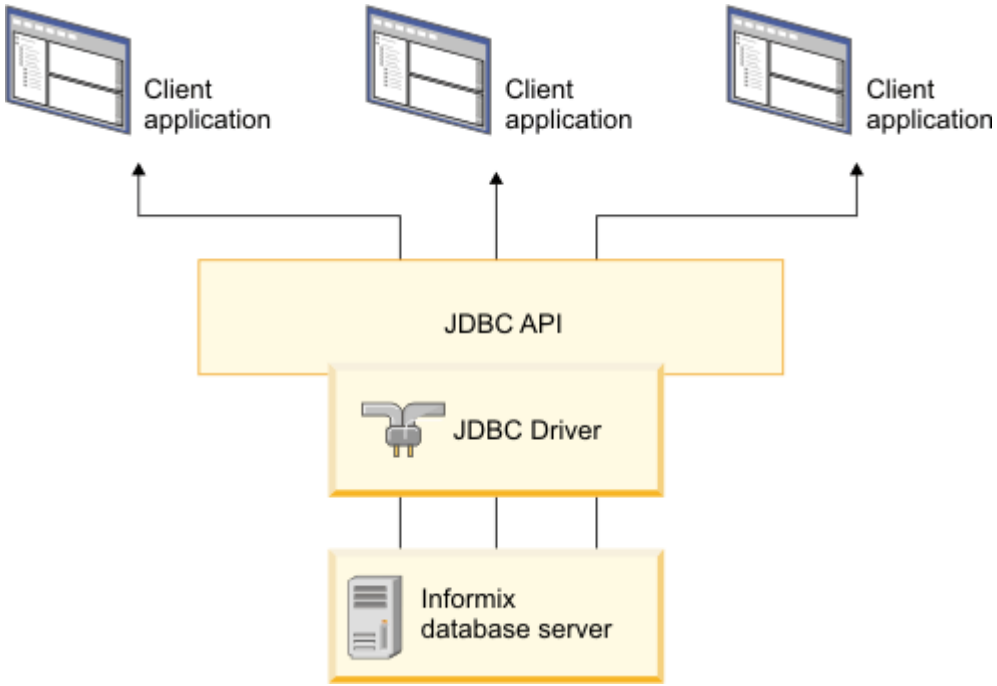
A utility for registering and unregistering DataBlade modules in Informix databases.

# Architecture of Informix database server and related products

## IBM INFORMIX JDBC DRIVER

The IBM Informix JDBC Driver lets Java programmers access Informix databases from within Java applications or applets. Programmers can create client applications that use JDBC to connect to IBM Informix query and retrieve data from a database or column, handle errors, and write UDRs.

The IBM Informix JDBC Driver is compatible with the JavaSoft JDBC specifications. It maps standard Java data types and IBM Informix data types.



# Architecture of Informix database server and related products

**IBM Informix BladeManager**

A utility to register and unregister DataBlade modules.

**IBM Informix Web Data Blade Module**

Tags and functions to create web applications that incorporate data that is retrieved dynamically from the Informix database.

**International Language Supplement**

The core Global Language Support locale files.

**IBM Data Studio**

An integrated development environment to develop and test SQL and XQuery queries, stored procedures, web services, and Java data access layers.

# Architecture of Informix database server and related products

**IBM Cognos Business Intelligence**

A web-based business intelligence solution with integrated reporting, analysis, score carding, and event management features.

**IBM SPSS Statistics Desktop and Data Drivers**

A set of tools for statistical analysis and drivers for various data sources.

**IBM SPSS Modeler**

A set of data mining tools to develop predictive models and deploy them into business operations to improve decision making.

# Informix Version 14 editions

**No-cost editions**

Informix no-cost editions can be downloaded and used for development and test purposes.

**IBM Informix Developer Edition**

For application development and testing only, this edition packs the full suite of Informix functionality into an attractive price point: free!

The Developer Edition includes all the functionality available in the Informix Enterprise Edition with scalability constraints including processing, memory, storage, and connection limitations.

It is available on a wide range of operating systems in 32- and 64-bit versions where appropriate.

# Informix Version 14 editions

**IBM Informix Innovator-C Edition**

For customers looking for a robust database environment that can support small production workloads, this edition provides the most widely used data processing functionality.

Available on all supported platforms, this edition is limited to one core and a total of 2GB of RAM operating from the same install.

The Informix Innovator-C Edition can be used for small end-user production workloads without a license fee.

Support is community-based though an optional for-charge service and support package is available for Informix Innovator-C edition.

This Elite Software Support provides full support and product updates for the term of the package.

# Informix Version 14 editions

**Fee (aka for-purchase) editions**

**IBM Informix Express Edition**

The Informix Express Edition is best suited for in-house or independent application developers or other third-party developers looking to embed a database engine within the application itself to support the application's functionality.

Available on all supported platforms, this edition is limited to four cores and a total of 8GB of RAM operating from the same Informix install.

In addition, there are other functional limitations including limiting ER/grid clusters to two nodes (root nodes only) and restricting an H/A cluster to one secondary (of any type).

# Informix Version 14 editions

**IBM Informix Workgroup Edition**

Available on all supported platforms, this edition is perfect for midsize companies or departmental servers in an enterprise deployment.

This edition can be deployed on up to 16 cores over a maximum of four sockets and 16GB of RAM operating from the same Informix install.

IBM Informix Workgroup Edition provides additional database functionality over Express Edition, including unlimited ER/grid cluster nodes of any type to send or receive data updates within the cluster.

# Informix Version 14 editions

**IBM Advanced Workgroup Edition**

The Informix Advanced Workgroup Edition represents the ultimate in data warehouse performance for small to midsize businesses or partners looking to create a turnkey data warehousing solution.

Advanced Workgroup includes entitlements to the base functionality of the Informix Workgroup Edition (including Flexible Grid/ER and well as H/A Cluster entitlements and restrictions), plus all the functionality of the IWA.

# Informix Version 14 editions

**IBM Informix Advanced Developer Edition**

Includes all Informix features and functionality, including Informix Warehouse Accelerator with unlimited scalability.

Available on all supported platforms, this edition is licensed by Authorized User only and is intended for pre-production development and testing only.

This edition can **NOT** be used for production purposes.

# Informix Version 14 editions

**IBM Informix Enterprise Edition**

Includes all Informix features and functionality (except those listed as optional add-ons) with unlimited scalability required for the highest OLTP and warehousing performance and full functionality.

Available on all supported platforms, this edition can be licensed by PVU and Authorized User Single Install metrics.

# Informix Version 14 editions

**IBM Informix Advanced Enterprise Edition**

The Informix Advanced Enterprise edition represents the ultimate in data warehouse performance and scalability as it includes entitlements to Informix Enterprise Edition, the IWA and the storage optimization feature.

This edition represents the ultimate in data warehouse performance and scalability.

This edition is available on 64-bit versions of AIX, Solaris, HP-UX, and Linux.

The IWA component is only available on 64-bit Linux either on Intel-based or PowerPC LE systems.

This edition can be licensed by PVU and Authorized User Single Install metrics.

With this edition, full H/A cluster and ER/grid functionality is available, including unlimited ER/grid and H/A cluster nodes.

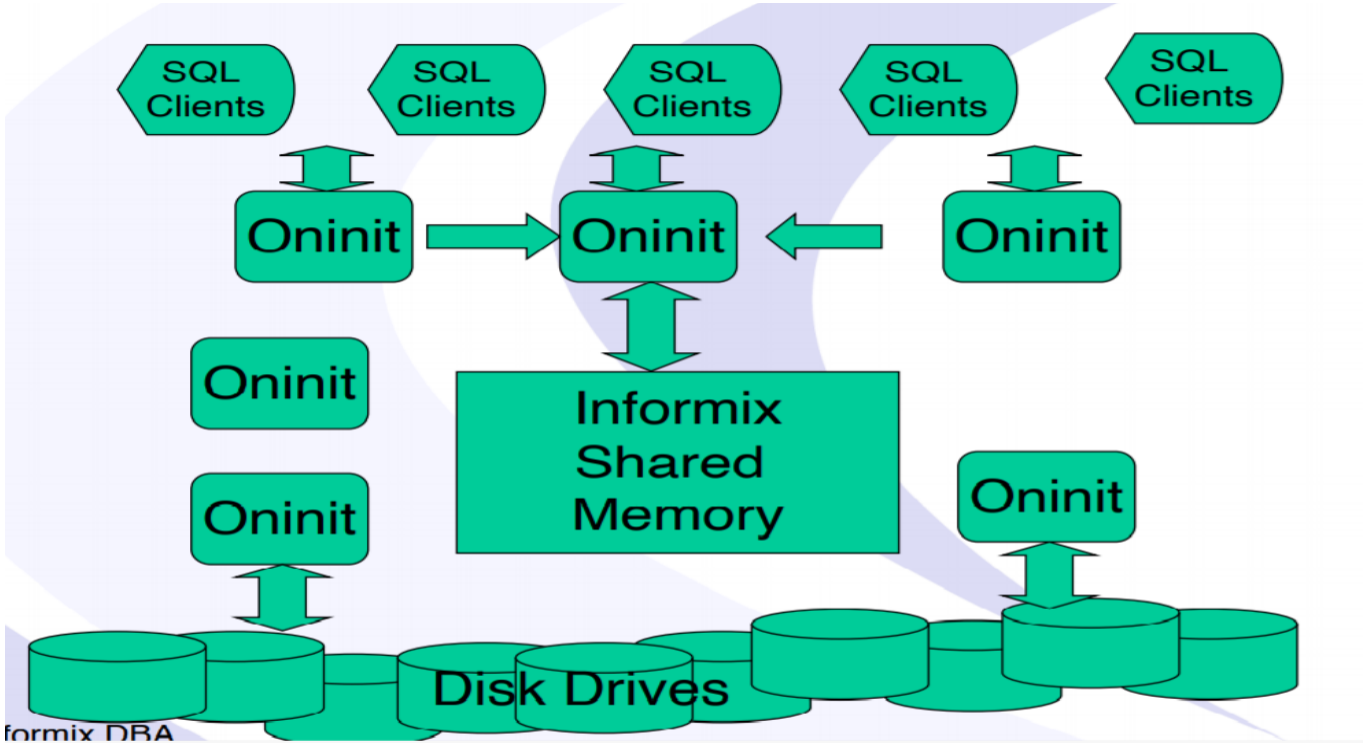
# Informix Architecture

SQL Client process

Server process – (onit)

Shared Memory

Disk space – (dbspace)



# Informix Terminology

**Instance**

Informix instance is a database server software that manages one or more Informix IDS databases.

Users login to an instance and access databases and database objects (tables, views, procedures etc).

**Database**

Informix database contains various database objects such as tables, views, store procedures etc.

# Informix Terminology

**Chunk**

A chunk is the largest unit of physical disk dedicated to database server data storage.

The maximum size of an individual chunk is 4 TB.

The number of allowable chunks is 32,766.

The following storage spaces are comprised of chunks:

Dbspaces

Blobspaces

Sbspaces

Temporary dB spaces

# Informix Terminology

**Dbspace**

A *dbspace* is a logical unit that can contain between 1 and 32,766 chunks.

The database server uses the dbspace to store databases and tables.

Place databases, tables, logical-log files, and the physical log in dbspaces.

# Informix Terminology

**BlobSpace**

A *blobspace* is a logical storage unit composed of one or more chunks that store only TEXT and BYTE data.

A blobspace stores TEXT and BYTE data in the most efficient way possible.

Can store TEXT and BYTE columns associated with distinct tables in the same blobspace.

# Informix Terminology

**Sbspace**

An *sbspace* is a logical storage unit composed of one or more chunks that store *smart large objects*.

Smart large objects consist of CLOB (character large object) and BLOB (binary large object) data types.

User-defined data types can also use sbspaces.

# Informix Terminology

**Temporary dbspace**

A *temporary dbspace* is a dbspace reserved exclusively for the storage of temporary tables.

It behaves differently from a standard dbspace in many ways.

A temporary dbspace is temporary only in the sense that the database server does not preserve any of its contents when the database server restarts.

The database server never drops a temporary dbspace unless it is explicitly directed to do so.

Temporary dbspaces cannot be mirrored by the database server.

Whenever you start the database server, all chunks in temporary dbspaces are recreated from scratch.

# Informix Terminology

**Temporary dbspace**

These chunks can therefore be located on RAM drives if desired.

The database server does not perform logical or physical logging for temporary dbspaces.

Because temporary dbspaces are not physically logged, fewer checkpoints and I/O operations occur, which improves performance.

# Data Types

CHARACTER [(length)] or CHAR [(length)]

VARCHAR (length)

BOOLEAN

SMALLINT

INTEGER or INT

DECIMAL [(p [, s])] or DEC [(p [, s])]

NUMERIC [(p [, s])]

REAL

# version of Informix

Make sure **INFORMIXDIR & PATH** environment variables are set

| Product | Command |
|---|---|
| INFORMIX DYNAMIC SERVER | dbaccess -V |
| INFORMIX STANDARD ENGINE (SE) | dbaccess -V |
| Informix 4GL Compiler Development | c4gl -V or i4gl -V |
| INFORMIX-4GL Rapid Development System | r4gl -V |
| INFORMIX-4GL Interactive Debugger | fgldb -V |
| INFORMIX-SQL, Runtime Facility | isql -V |
| INFORMIX-Client SDK | ifx_getversion clientsdk |

# Installing IBM Informix 14.10

To install Informix:

- Run the Informix install script ids_install.
- This will install the engine, the CSDK and JDBC.

root> ./ids_install

Follow the instructions given below to finish your installation:

To Begin Installation,Respond to each prompt to proceed to the next step in

the installation.If you want to change something on a previous step, type

'back'.

You may cancel this installation at any time by typing 'quit'.

PRESS <ENTER> TO CONTINUE:

# Installing IBM Informix 14.10

Press Enter to continue viewing the license agreement, or enter "1" to  accept the agreement, "2" to decline it, "3" to print it, or "99" to go back to the previous screen.: 1

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Installation Location

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Choose location for software installation

Default Install Folder: /opt/informix

ENTER AN ABSOLUTE PATH, OR PRESS <ENTER> TO ACCEPT THE DEFAULT:

# Installing IBM Informix 14.10

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Installation or Distribution

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Select the installation type.

Typical: This installation is pre-configured, and requires

a minimal number of configuration choices.

Features for common business needs are installed. Includes:

** Client Software Development Kit (CSDK).

** Java Database Connectivity (JDBC).

# Installing IBM Informix 14.10

Custom: This installation requires greater knowledge ofIBM Informix technology. You can select features

and custom server configurations for your

specific business needs.

Legacy : Run an installation command to extract Informix

media files that you can redistribute by scripts.

RPM: Create a custom RPM Package Manager image

that you can deploy as a silent installation.

# Installing IBM Informix 14.10

Optionally install a configured database server instance.

Minimum disk space required: 75 MB (without a server instance)

->1- Typical installation

2- Custom installation

3- Extract the product files (-DLEGACY option)

4- Create a RPM package for redistribution

ENTER THE NUMBER FOR YOUR CHOICE, OR PRESS <ENTER> TO ACCEPT THE DEFAULT::

# Installing IBM Informix 14.10

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Server Instance

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Type 'back' to go to the previous step or 'quit' to cancel the installation.

Create a database server instance?

->1- Yes - create a server instance

2- No - do not create a server instance

ENTER THE NUMBER FOR YOUR CHOICE, OR PRESS <ENTER> TO ACCEPT THE DEFAULT:: 2

# Installing IBM Informix 14.10

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Disk Space Information (for Installation Target):

Required:  579,046,746 Bytes

Available: 57,303,822,336 Bytes

PRESS <ENTER> TO CONTINUE:

# Installing IBM Informix 14.10

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Ready To Install

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InstallAnywhere is now ready to install IBM Informix Software Bundle onto your

system at the following location:

/opt/informix

PRESS <ENTER> TO INSTALL:

# Installing IBM Informix 14.10

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Installing...

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[==========|==========|==========|==========]

[----------|----------||----------|----------]

# Installing IBM Informix 14.10

Congratulations! IBM Informix Software Bundle installation is complete.

Product install status:

Informix Dynamic Server: Successful

Informix Client-SDK: Successful

For more information about using Informix products, see the IBM Informix 12.10

Information Center at http://pic.dhe.ibm.com/infocenter/informix/v121/index.

jsp.

PRESS <ENTER> TO EXIT THE INSTALLER:

# Setup ONCONFIG parameters

The configuration file for the IBM Informix server is identified by the $ONCONFIG environment variable

if you have not set the %ONCONFIG% environment variable, the name used is onconfig.

An Informix installation includes a default configuration file at $INFORMIXDIR/etc/onconfig.std.

The command-line **genoncfg** utility provides an alternate way to set the configuration parameters of an Informix instance.

Do not modify or delete onconfig.std, which is a template and not a functional configuration.

To prepare an Informix configuration file:

- Copy the onconfig.std template file.
- Modify the copy of the template file. The default value for the DUMPDIR parameter is $INFORMIXDIR/tmp. If you change this value in your configuration file, make sure that you specify a valid directory on your computer.

# Setup ONCONFIG parameters

Set the ONCONFIG environment variable to the name of your customized configuration file.

If you omit a parameter value in your copy of the configuration file, the database server either uses default values in onconfig.std or calculates values based on other parameter values.

Prepare for New Instance – onconfig file

Modify onconfig.instance

- ROOTPATH: Set to the full path of the root chunk or link
- SERVERNUM: Set to a number not already used on the server
- DBSERVERNAME: Set to the new instance name
- TAPEDEV: Set to a valid file, directory, tape device or /dev/null
- LTAPEDEV: Set to a valid file, directory, tape device or /dev/null

# SQLHOSTS file changes

The sqlhosts file defines database server connections that are valid for the client-server environment.

For each database server, this file defines the following information:

- The name of the database server.
- The type of connection to make between the client application and the database server.
- The name of the host computer where the database server is.
- The name of a system file or program to use to establish a connection.

The application expects to find the sqlhosts file in the $INFORMIXDIR/etc directory

you can change this location or the name of the file with
the INFORMIXSQLHOSTS environment variable.

If the database server is not on the computer where the client program runs, an sqlhosts file must be on the host computers of both the Informix ESQL/C client program and the database server.

The client application can connect to any database server that the sqlhosts file defines.

# Database server operating modes

**Offline mode**

The database server is not running. Shared memory is not allocated.

Only the administrator (user informix) can change from this mode to another mode.

**Quiescent mode**

Database-server processes are running and shared-memory resources are allocated.

Administrators use this mode to perform maintenance functions that do not require the execution of SQL and DDL statements.

Only the administrator (user informix) can access the database server.

Other users can view database-server status information, but they cannot access the database server.

# Database server operating modes

**Administration mode**

This mode is an intermediary mode between Quiescent mode and Online mode.

Administrators use this mode to perform any maintenance task, including tasks requiring the execution of SQL and DDL statements.

Administrators can also perform all other functions available in Online mode.

The following users can connect to the database server in administration mode:

- User informix
- Users who have the DBSA role

# Database server operating modes

## Administration mode

Set the ADMIN_USER_MODE_WITH_DBSA configuration parameter to 1 if you want users who are members of the DBSA group (in addition to user informix) to connect to the database server in administration mode.

- One or more users who have administration mode access

User Informix or a DBSA can dynamically give one or more specific users the ability to connect to the database server in administration mode through the onmode –j command, the oninit -U command, or the ADMIN_MODE_USERS configuration parameter.

Other users can view database-server status information, but they cannot access the database server.

# Database server operating modes

**Online mode**

This is the normal operating mode of the database server.

Any authorized user can connect with the database server and perform all database activities.

User informix or user root can use the command-line utilities to change many database server ONCONFIG parameter values.

# Database server operating modes

In addition, the database server can also be in one of the following modes:

***Read-only mode*** is used by the secondary database server in a data replication environment. An application can query a secondary database server that is in read-only mode, but the application cannot write to a read-only database.

***Recovery mode*** is transitory. It occurs when the database server performs fast recovery or recovers from a system archive or system restore. Recovery occurs during the change from offline to quiescent mode.

***Shutdown mode*** is transitory. It occurs when the database server is moving from online to quiescent mode or from online (or quiescent) to offline mode.

After shutdown mode is initiated, it cannot be canceled.

Users permitted to change modes

# Changing database server operating modes

Use the oninit and onmode utilities to change from one database server operating mode to another.

Use the ADMIN_MODE_USERS configuration parameter to specify which users can connect to the server in administration mode.

**onmode -k, -m, -s, -u, -j: Change database server mode**

**-k** Takes the database server to offline mode and removes shared memory. To reinitialize shared memory, shut down and restart the database server.

**-m** Takes the database server from quiescent or administration mode to online mode.

**-s** Shuts down the database server gracefully. Users who are using the database server are allowed to finish before the database server comes to quiescent mode, but no new connections are allowed. When all processing is finished, -s takes the database server to quiescent mode. The -s option leaves shared memory intact.

# Changing database server operating modes

**onmode -k, -m, -s, -u, -j: Change database server mode**

**-u** Shuts down the database server immediately. This option brings the database server to quiescent mode without waiting for users to finish their sessions. Their current transactions are rolled back, and their sessions are terminated.

**-j** Puts the database server into administration mode. This option brings the database server to administration mode, allowing the informix user all functions including the issuance of SQL and DDL commands. The -j -U option enables the DBSA to designate specific users (in addition to the informix user) to access the database server.

# Changing database server operating modes

**Taking the Database Server to Offline Mode with the -k Option**

The **onmode -k** option takes the database server to offline mode and removes database server shared memory.

A prompt asks for confirmation.

Another prompt asks for confirmation to kill user threads before the database server comes offline.

If you want to eliminate these prompts, execute the **-y** option with the **-s** option.

This option does not kill all client sessions.

Use the **-u** option to avoid hanging client sessions or virtual server processes.

# Changing database server operating modes

**Bringing the Database Server Online with the -m Option**

The **-m** option brings the database server online from quiescent mode.

**Shutting Down the Database Server Gracefully with the -s Option**

The **-s** option causes a graceful shutdown.

Users who are using the database server are allowed to finish before the database server comes to quiescent mode, but no new connections are allowed.

When all processing is finished, **-s** takes the database server to quiescent mode.

The **-s** option leaves shared memory intact.

A prompt asks for confirmation. If you want to eliminate this prompt, execute the **-y** option with the **-s** option.

# Changing database server operating modes

**Shutting Down the Database Server Immediately with the -u Option**

The **-u** option causes immediate shutdown.

This option brings the database server to quiescent mode without waiting for users to finish their sessions.

Their current transactions are rolled back, and their sessions are terminated.

A prompt asks for confirmation.

Another prompt asks for confirmation to kill user threads before the database server comes to quiescent mode.

To eliminate these prompts, execute the **-y** option with the **-s** option.

A prompt asks for confirmation.

To eliminate this prompt, execute the **-y** option with the **-s** option.

# Changing database server operating modes

**Changing the Database Server to Administration Mode with the -j Option**

The **-j** option puts the database server into the administration mode and allows only the DBSA group and the user **informix** to connect to the server.

The **-j** option allows a DBSA to have the server in a fully functional mode to perform maintenance.

The **-j -U** option enables the DBSA to grant individual users access to the database server in administration mode.

Once connected, these individual users can execute any SQL or DDL command.

When the server is changed to administration mode, all sessions for users other than user **informix**, the DBSA group users, and those identified in the **onmode -j -U** command lose their database server connection.

# Changing database server operating modes

Ex:- onmode -j -U karin,sarah,Andrew

Enables three individual users to connect to the database server and have database server access until the database server mode changes to offline, quiescent or online mode

Access for individual users can also be removed by executing **onmode -j -U** and removing their name from the new list of names in the command.

For example, in the following commands, the first command grants only Karin access, the second command grants Karin and Sarah access, and the third command grants only Sarah access (and removes access from Karin).

- onmode -j -U karin
- onmode -j -U karin,sarah
- onmode -j -U sarah

# Changing database server operating modes

To allow user **informix** and the DBSA group user to retain their database server access in administration mode and remove all single users from accessing the database server, use the following command:

- onmode -j -U ' '

# Bounce Informix server instance

You run the **onmode** utility to stop the database server, and the **oninit** utility to start the database server.

To stop the database server, run the **onmode -ku** command.

To start the database server, run the **oninit** command.

You can include options to the oninit command.

For example, you suppress verification prompts by running the **oninit -y** command.

**Stopping and starting the database server (Windows)**

- You stop and start the database server with the Services application.